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(54) **Power supply control arrangements for television receivers**

(57) A power supply control arrangement for a television receiver 1 comprises manual power switch 20 for controlling the power supply to the television receiver 1, a timing circuit 5 for generating a time code representing the time of day and including a reference signal generator 4 and a frequency divider for dividing the frequency of the reference signal, a first input key device 10 for generating a start time code representing a presettable start time and an end time code representing a presettable end time, a first memory 8 for memorizing the start time code, a second memory 9 for memorizing the end time code, a first coincidence detector 17 for detecting the coincidence of the outputs of the timing circuit 5 and the first memory 8 and then generating a first coincidence output, a second coincidence detector 18 for detecting the coincidence of the outputs of the timing circuit 5 and the second memory 9 and then generating a second coincidence output, a first circuit 30, 21, etc. responsive to the first coincidence output and for disabling or enabling the operation of the manual power switch 20, and a second circuit 30, 22, etc. responsive to the second coincidence output and for enabling or disabling the operation of the manual power switch 20. The arrangement is for preventing or permittting the switching ON of a T.V. receiver during the predetermined period or periods pre-set into the memories by manipulation of setting switches.

In an embodiment, Figure 2, the timed control can be overridden by a remote control unit from which infrared signals are transmitted to a photo diode in the receiver.

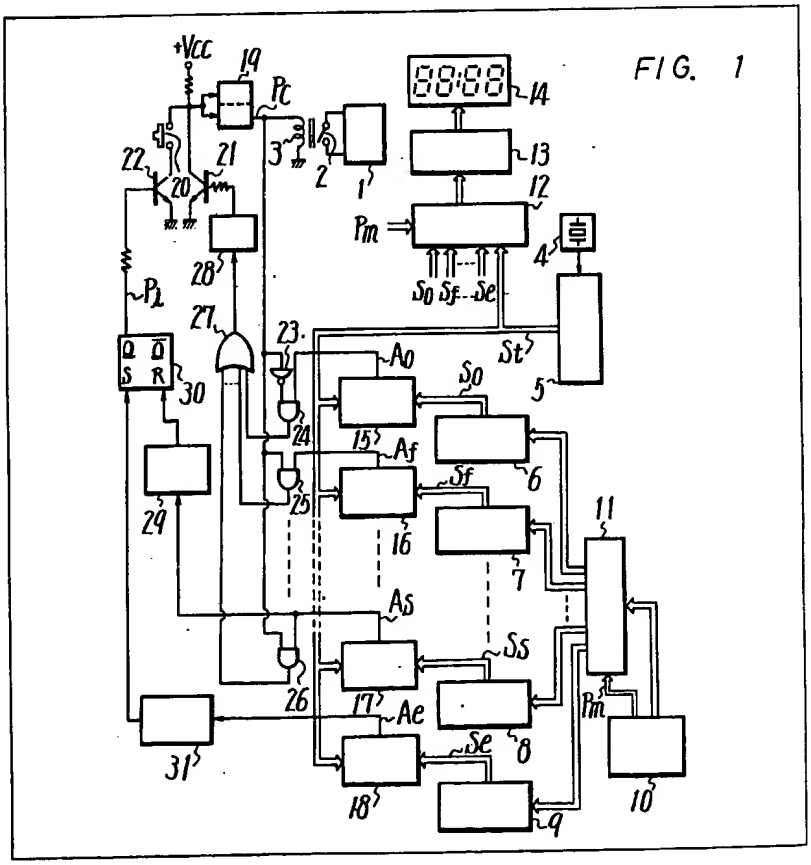

FIG. 1

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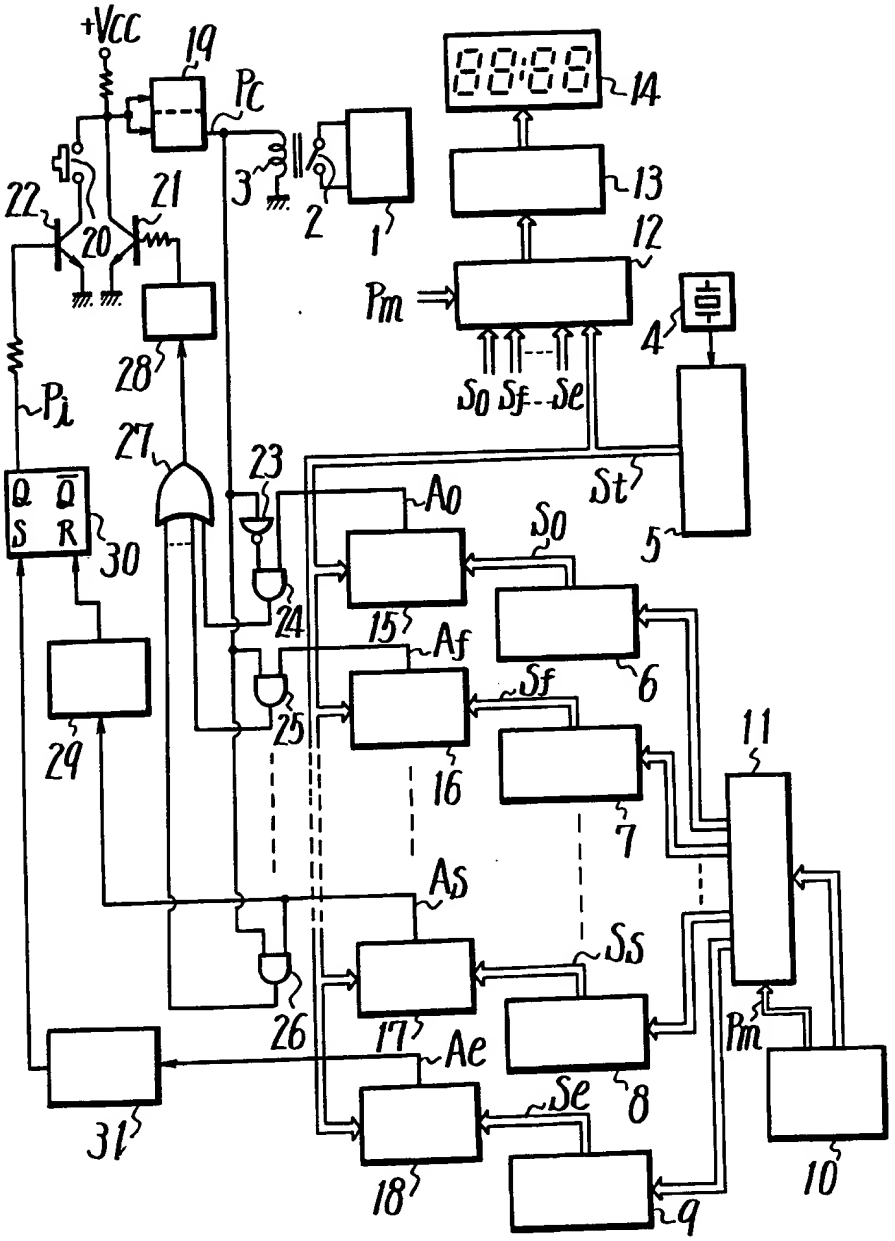
FIG. 1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19
Pc
3
2
1
22
21
20
28
Pi
27
23
Q Q̄
S R
30
24
25
29
31
26
88:88
14
13
12
Pm
So Sf Se
4
St
5
Ao
So
15
Af
Sf
6
16
7
11
As
Ss
17
Ae
Se
8
18
9
Pm
10

FIG. 2

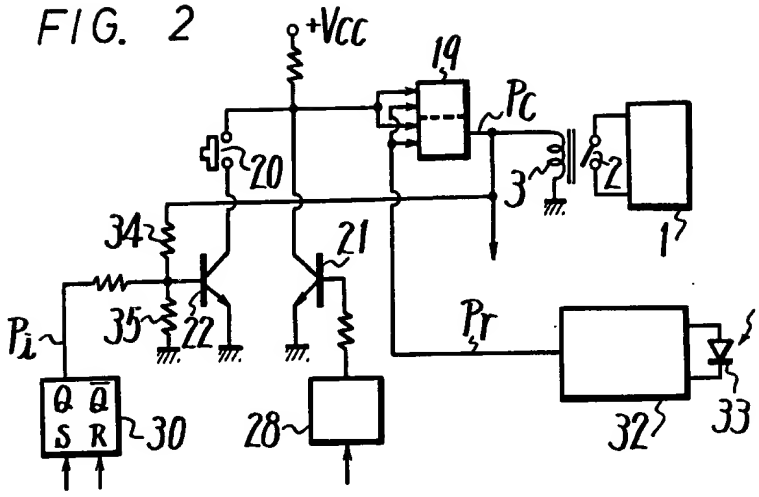
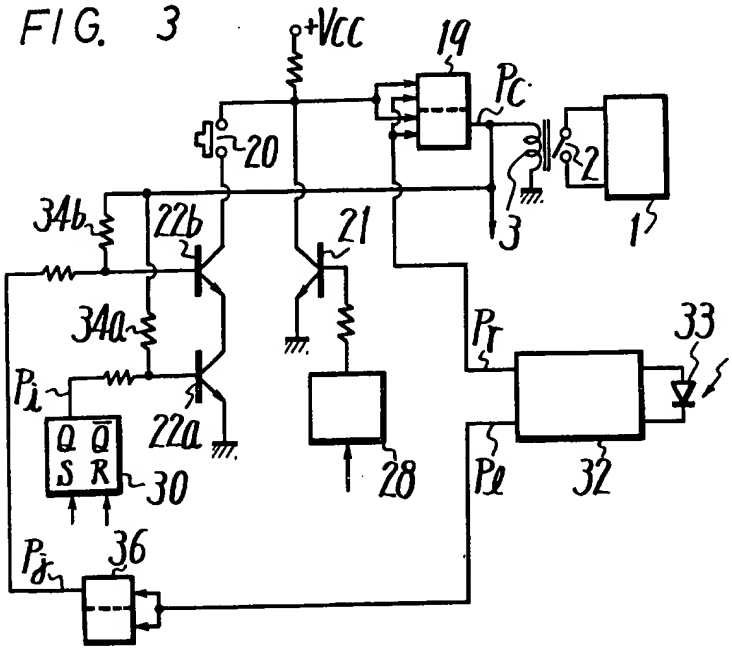

+Vcc
19
Pc
20
3
2
1
34
21
35
22
Pl
Pr
Q Q̄
S R
30
28
32
33

FIG. 3


+Vcc
19
Pc
20
2
1
3
34b
22b
21
34a
Pl
Pr
33
Q Q̄
S R
22a
30
28
Pd
32
Pj
36

SPECIFICATION

Power supply control arrangements for television receivers

This invention relates to power supply control arrangements for television receivers.

Such a power supply control arrangement can be used to prevent a child from watching television too much. For this purpose there has already been proposed an apparatus for mechanically locking the power switch of a television receiver by means of a key. However with this apparatus there is a risk of the key being lost, or otherwise not being available when required.

According to the present invention there is provided a power supply control arrangement for a television receiver, the arrangement comprising:

a manual power switch controlling the power supply to the television receiver;

timing means for generating a time code representing the time of day and including a reference signal generator and a frequency divider for dividing the frequency of the reference signal;

first input key means for generating a start time code representing a presettable start time;

first memory means for memorizing the start time code from said first input key means;

second input key means for generating an end time code representing a presettable end time;

second memory means for memorizing the end time code from said second input key means;

first coincidence detector means for detecting the coincidence of the outputs of said timing means and said first memory means and generating a first coincidence output when the outputs of said timing means and said first memory means coincide;

second coincidence detector means for detecting the coincidence of the outputs of said timing means and said second memory means and generating a second coincidence output when the outputs of said timing means and said second memory means coincide;

first means responsive to the first coincidence output and for disabling or enabling the operation of said manual power switch; and

second means responsive to the second coincidence output and for enabling or disabling the operation of said manual power switch.

The invention will now be described by way of example with reference to the accompanying drawings, throughout which like references designate like elements, and in which:

Figure 1 is a block diagram of an embodiment of power supply control arrangement for a television receiver and according to the invention; and

Figures 2 and *3* are block diagrams respectively showing parts of two further embodiments of the invention.

Referring to Figure 1, the power supply to a television receiver 1 is switched ON and OFF by the cooperation of a relay contact 2 and a relay winding 3. However, the power supply to circuits forming a timer apparatus remain ON, whether derived from a battery or the mains, except when the supply is physically disconnected.

A reference signal from a reference oscillator 4 such as a quartz-controlled oscillator is supplied to a clock circuit 5 which includes a frequency divider circuit which frequency-divides the reference signal to produce a frequency-divided output of one minute period, a decimal counter which is supplied with the frequency-divided output, a 6-scale counter which is supplied with the output of the decimal counter, and a 24-scale counter which is supplied with the output of the 6-scale counter. Thus a time code St comprising codes corresponding units of minutes, tens of minutes and tens of hours is derived from the respective counters.

A switch-ON time memory 6 is provided which memorizes an ON-time code So corresponding to the switch-ON time of the power supply. This ON-time memory 6 includes, similar to the clock circuit 5, a plurality of counters and memorizes a desired switch-ON time in hours and minutes set by the key operation in a setting device 10. In addition to the ON-time memory 6, there are provided an OFF-time memory 7, a start-time memory 8, and an end-time memory 9. Although not shown there may be provided a plurality of ON-time memories and OFF-time memories. An OFF-time code Sf memorized in the OFF-time memory 7, a start-time code Ss memorized in the start-time memory 8, and an end-time code Se memorized in the end-time memory 9 are also set by the key operation of the setting device 10. In the setting device 10, there are provided three time setting switches for setting the values of the respective figures for units of minutes, tens of minutes and units of hours and presetting change-over switches corresponding to the respective memories 6 to 9. Firstly, the presetting change-over switches are selectively operated to generate a mode signal Pm, and then the time setting switches are operated to set desired times. The mode signal Pm is fed to a change-over circuit 11 to control it so that the setting signals generated in the setting device 10 are supplied to the corresponding memories 6 to 9.

The time codes So and Se memorized in the memories 6 to 9 and the time code St from the clock circuit 5 are fed to a change-over circuit 12. This change-over circuit 12 is controlled by the mode signal Pm similar to the change-over circuit 11. In the normal clock mode, the time code St is selected by the change-over circuit 12 and fed to a display circuit 13, while in the presetting mode in which the presetting change-over switches of the setting device 10 are operated, the time code which is preset is selected by the change-over circuit 12 and fed to the display circuit 13. The display circuit 13 includes a decoder, which decodes the time code and produces a display signal, and a drive circuit which is supplied with the display signal. The display signal from the drive circuit is supplied to a display device 14 which has four figure display patterns each of which has seven display segments arranged in a figure "8". Two patterns are used to display the tens and units of hours and two patterns are used to display the tens and units of minutes. Display segments of a dot shape are located between the hours and minute

patterns to distinguish the hour and minute displays. The display segments can, for example, be the anodes or cathodes of display discharge tubes, light emitting diodes, or the electrodes of liquid quartz or liquid crystal devices.

For example, when a lock start time is set in the presetting mode, the presetting change-over switch for the start time in the setting device 10 is pushed to display the time corresponding to the start time code Ss on the display device 14, and while viewing the display on the display device 14, the time setting switch of the setting device 10 is pushed. Every time this switch is pushed, the units of minutes, tens of minutes or hours are advanced to set a desired lock start time. After the above setting operation is finished, the display device 14 displays the present time of day. Although not shown, in the setting device 10, there are provided a cancel switch and a code generating circuit which will generate a useless code (which does not represent a time) when the cancel switch is put ON. Thus, the cancel switch can write a useless code in a predetermined memory selected by the presetting change-over switch to erase a time previously preset.

In the embodiment of Figure 1, there are further provided a coincidence detector circuit 15 which is supplied with the time code St and the ON-time code So, a coincidence circuit 16 which is supplied with the time code St and the OFF-time code Sf, a coincidence detector circuit 17 which is supplied with the time code St and the start time code Ss, and a coincidence detector circuit 18 which is supplied with the time code St and the end time code Se. When the two input codes to any one of the coincidence detector circuits 15 to 18 are coincident with each other, detected outputs Ao, Af, As and Ae from the coincidence detector circuits 15 to 18 become "1".

The relay winding 3 is connected between the output terminal of a flip-flop circuit 19 and ground. When an output Pc from the flip-flop circuit 19 is "1", the relay winding 3 is energized to make the relay contact 2 ON and hence the power supply of the television receiver 1 is ON. When the output Pc is "0", the relay winding 3 is not energized so that the relay contact 2 is not made ON and the power supply of the television receiver 1 is OFF.

The flip-flop circuit 19 is inserted in state at every supply of the trigger pulse which is generated by operating a manual power switch 20 of a push-button type or by the switching operation of a transistor 21. A power supply terminal, to which a positive *dc* voltage $+V_{CC}$ is supplied, is connected through the power switch 20 to the collector of a transistor 22 and also directly to the collector of the transistor 21. The emitters of the transistors 21 and 22 are both grounded. Thus, when the power switch 20 is made ON with the transistor 22 ON, or when the transistor 21 becomes ON, the trigger pulse is generated.

The output Pc from the flip-flop circuit 19 is supplied through an inverter 23 to one input terminal of an AND gate 24 which is also supplied, at the other input terminal, with the detected output Ao from the coincidence detector circuit 15. The output Pc from the flip-flop circuit 19 is also supplied to AND gates 25 and 26. The AND gate 25 is also supplied with the detected output Af and the AND gate 26 is also supplied with the detected output As. Although not shown, the detected outputs from other coincidence detector circuits, which will detect ON and OFF times, and also the output Pc or its inverted output from the flip-flop circuit 19 are supplied to other AND gates. The outputs from the AND gates 24, 25 and 26 and the other AND gates are supplied to an OR gate 27, the output of which is supplied to a monostable multivibrator 28 to trigger it. The output from the monostable multivibrator 28 is supplied to the base of the transistor 21.

When the power supply of the television receiver 1 is OFF, since the output Pc is "0", the detected output Ao from the coincidence detector circuit 15 is "1". Thus, the monostable multivibrator 28 is triggered at the rising edge of the output Ao and then the transistor 21 is made ON by the output from the monostable multivibrator 28. Thereby, the output Pc from the flip-flop circuit 19 is made "1", to make the power supply of the television receiver 1 ON at the set time. When the output Af from the coincidence detector circuit 16 becomes "1" with the power supply of the television receiver ON, the flip-flop circuit 19 is triggered, hence its output Pc becomes "0" and the power supply becomes OFF at the set time. Similarly, when the lock start time arrives while the power supply is ON, the transistor 21 is made ON by the detected output As supplied from the coincidence detector circuit 17 and hence the power supply is made OFF.

The detected output As is further supplied to a differentiation circuit 29 the differentiated output pulse from which is supplied to a flip-flop circuit 30. Thus, the flip-flop circuit 30 is reset at the differentiated pulse which is produced at the rising edge of the detected output As. When the flip-flop circuit 30 is in the reset state, its output Pi is "0", which is supplied to the base of the transistor 22. Accordingly, since the output Pi becomes "0" after the start time, the transistor 22 then becomes OFF. Hence, even if the power switch 20 is made ON, no trigger pulse for the flip-flop circuit 19 is produced and the power supply of the television receiver 1 is locked in the OFF state.

The flip-flop circuit 30 can be set by the pulse generated from a differentiation circuit 31 at the rising edge of the detected output Ae from the coincidence detector circuit 18. Accordingly, when the detected output Ae becomes "1", at the lock end time, the flip-flop circuit 30 is set and its output Pi becomes "1". Thereby, the transistor 22 becomes ON and the lock OFF of the power supply is released. In the above manner, from the set start time to the end time, even if the power switch 20 is operated, the power supply of the television receiver 1 cannot be made ON.

It is possible to employ a power supply ON lock such that only during the time period between the set start time and the end time, can the power supply of the television receiver 1 be made ON and OFF by the power switch 20 and during other time periods the power supply of the television receiver 1 cannot

be made ON. To this end, it is enough that an output $\overline{Pi}$ from the flip-flop circuit 30, which becomes "1" when the flip-flop circuit 30 is in the reset-state and "0" when the flip-flop circuit 30 is in the set-state, is supplied to the base of the transistor 22.

If the power supply is desired to be released from the lock state before the set lock end time, this is achieved by setting the ON-time code So corresponding to the preset time of day in the ON-time memory 6. It is of course possible for a lock releasing switch, which will produce a pulse setting the flip-flop circuit 30, additionally to be provided. However, it is preferred that the lock is not easily released.

If when the power supply OFF lock is effected, only the lock start time is preset but the lock end time is not preset, then the lock is not released and there is a risk that the apparatus is erroneously considered to be out of order. To avoid this problem, one possibility is to arrange that when the lock end time is not preset the whole operation is ineffective, and another possibility is to arrange that an end time code Se corresponding to a predetermined time, for example, three hours after the start time is automatically set in the end-time memory 9.

Figure 2 shows parts of another embodiment of the invention. With this embodiment, even in the power supply lock state where the operation of the power switch 20 is ineffective, the power supply can be made ON and OFF by a remote control operation.

A receiver circuit 32 will receive a remote control signal emitted from a transmitter (not shown in Figure 2). When the power ON and OFF switch provided in the transmitter is pushed, a light emitting diode of the transmitter is made ON and OFF by a radio frequency signal with a predetermined frequency and produces a remote control infra-red signal. The infra-red signals from the transmitter are received by a photo-diode 33 the output of which is amplified and detected by the receiver circuit 32 from which a negative control pulse Pr is generated. At the falling edge of the control pulse Pr, the state of the flip-flop circuit 19 is inverted. Thus, even in the power supply lock state, the power supply of the television receiver 1 can be made ON and OFF. Accordingly, a child can be prevented from watching television too much by the power supply OFF lock, but his parents can watch the television at a desired time by operating the transmitter. The OFF operation will be inconvenient if the power supply can only be made OFF by the remote control. Therefore, in the embodiment of Figure 2, the output Pc from the flip-flop circuit 19 is divided by resistors 34 and 35 and then supplied to the base of the transistor 22 to make it possible that, even if the power supply OFF lock, the OFF operation by only the power switch 20 is effective. Otherwise the embodiment of Figure 2 is substantially the same as that of Figure 1.

Figure 3 shows parts of a futher embodiment of the invention in which, similar to the embodiment of Figure 2, the control pulse Pr is produced in response to the remote control signal and the flip-flop circuit 19 is triggered by the control pulse Pr. Moreover, the power supply OFF lock at the set time is carried out by the output Pi from the flip-flop circuit 30 similar to the embodiment of Figure 1 and the set and release of the lock state can be performed by the remote control operation.

In the transmitter for the remote control operation, there are provided the switch for making the power supply ON and OFF and the switch for making the lock set and release. By making the respective switches ON, two remote control signals, which are distinguished for example in frequency, pulse width, or code are transmitted from the transmitter. The remote control signals are received and distinguished by the receiver circuit 32 so that the receiver circuit 32 produces control pulses Pr and Pl. The control pulse Pl is supplied to a flip-flop circuit 36 as a trigger pulse. Every time the control pulse Pl is supplied to the flip-flop circuit 36, it is inverted in state. An output Pj from the flip-flop circuit 36 is supplied to the base of a transistor 22*b* the collector of which is connected through the power switch 20 and a resistor to the $+V_{CC}$ *dc* power supply terminal and the emitter of which is connected to the collector of a transistor 22*a* the emitter of which is in turn connected to ground. The base of the transistor 22*a* is supplied with the output Pi from the flip-flop circuit 30 similar to the above embodiment, and the output Pc from the flip-flop circuit 19 is supplied through resistors 34*a* and 34*b* to the bases of the transistors 22*a* and 22*b*, respectively.

With the embodiment of Figure 3, when the outputs Pj and Pi from the flip-flop circuits 36 and 30 are both "1", the transistors 22*a* and 22*b* are both ON and hence the operation of the power switch 20 is effective. When either one of the outputs Pi and Pj is "0", the ON operation of the power switch 20 is ineffective. In this case, however, the ON and OFF operation of the power supply may be carried out by the remote control operation and the OFF operation may be effective by the power switch 20.

Moreover, let it be assumed that the switches for lock set and release are made ON in the transmitter to produce the control pulse Pl from the receiver circuit 32 and to make the output Pj from the flip-flop circuit 36 "0" by the control pulse Pl. At this time, if the power supply is OFF (Pc="0") and even if the time is other than in the power supply OFF lock period and Pi="1", the operation of the power switch 20 thereafter can be ineffective. Moreover, if the power supply is ON (Pc="1"), the operation of the power switch 20 can be similarly made ineffective after the power switch 20 is made ON to make the power supply OFF.

Next, when the lock set and release switches in the transmitter are pushed again and the control pulse Pl is produced from the receiver circuit 32, the flip-flop circuit 36 is inverted and hence the output Pj becomes "1" with the result that the lock state is released. In the above manner the operation of the power switch can be made ineffective from a present time to a desired time by the remote control operation.

With the embodiment of Figure 3, for a person having the transmitter, the operation of the power switch can be made ineffective and also the ON and OFF of the power supply can be controlled.

If desired, it is possible to provide a light source to

indicate the period between the set lock start time and the lock end time or between the lock state set by the remote control operation and the release thereof thereby to avoid an erroneous impression of a malfunction.

It is also possible for the power supply control arrangement to function such that, at the same time the ON time of the power supply of the televison receiver is set, a channel to be received at the ON time is preset. This channel presetting can be realized by arranging that a channel code is fed at the ON time to the channel selection control apparatus of a tuner of an electronic tuning system provided with a variable reactance element as a tuning element.

CLAIMS

1. A power supply control arrangement for a television receiver, the arrangement comprising:

a manual power switch for controlling the power supply to the television receiver;

timing means for generating a time code representating the time of day and including a reference signal generator and a frequency divider for dividing the frequency of the reference signal;

first input key means for generating a start time code representing a presettable start time;

first memory means for memorizing the start time code from said first input key means;

second input key means for generating an end time code representing a presettable end time;

second memory means for memorizing the end time code from said second input key means;

first coincidence detector means for detecting the coincidence of the outputs of said timing means and said first memory means and generating a first coincidence output when the outputs of said timing means and said first memory means coincide;

second coincidence detector means for detecting the coincidence of the outputs of said timing means and said second memory means and generating a second coincidence output when the outputs of said timing means and said second memory means coincide;

first means responsive to the first coincidence output and for disabling or enabling the operation of said manual power switch; and

second means responsive to the second coincidence output and for enabling or disabling the operation of said manual power switch.

2. An arrangement according to claim 1 wherein said manual switch is non-lock type switch generating a trigger signal for a first flip-flop circuit, the output of said first flip-flop circuit controlling the power supply of the television receiver.

3. An arrangement according to claim 1 wherein the first coincidence output is supplied to a set or reset input of a second flip-flop circuit and the second coincidence output is supplied to the reset or set input of said second flip-flop circuit, the output of the second flip-flop circuit enabling or disabling the operation of said manual switch.

4. An arrangement according to claim 3 wherein the output of the second flip-flop circuit enables or disables the generation of the trigger signal for said first flip-flop circuit.

5. An arrangement according to claim 2 further comprising trigger signal generating means for said first flip-flop circuit independent from said manual power switch.

6. An arrangement according to claim 5 wherein said trigger signal generating means is a receiver for a remote control signal.

7. A power supply control arrangement for a television receiver, the arrangement being substantially as hereinbefore described with reference to Figure 1 of the accompanying drawings.

8. A power supply control arrangement for a television receiver, the arrangement being substantially as hereinbefore described with reference to Figure 1 as modified by Figure 2 of the accompanying drawings.

9. A power supply control arrangement for a television receiver, the arrangement being substantially as hereinbefore described with reference to Figure 1 as modified by Figure 3 of the accompanying drawings.

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